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(71) Applicant *(for all designated States except US)*: GN DANAVOX A/S [DK/DK]; Mårkærvej 2A, DK-2630 Taastrup (DK).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)* : BANG, Jens [DK/DK]; Thagaard Plantage 24, DK-7600 Struer (DK). DIOT, Michel [FR/FR]; 2, allée des Dimanches, F-78430 Louveciennes (FR).

(74) Agent: LARSEN & BIRKEHOLM A/S; Skandinavisk Patentbureau, Skagensgade 64, Box 200, DK-2630 Taastrup (DK).

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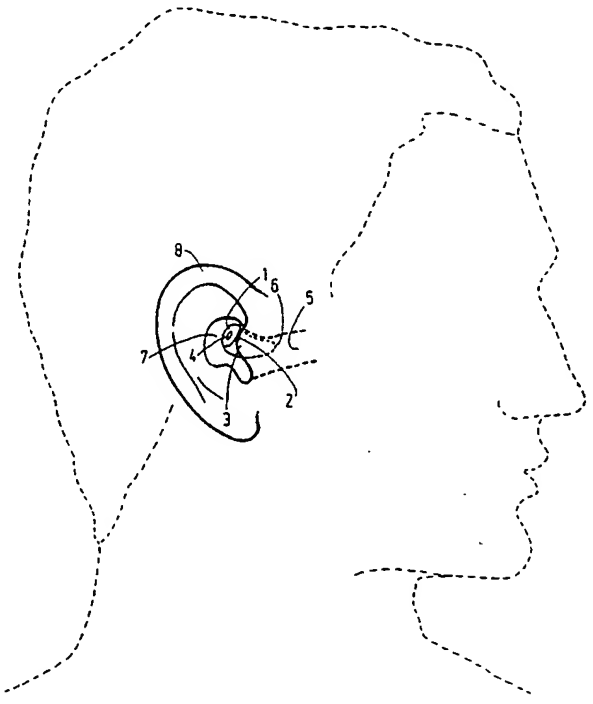
(54) Title: METHOD FOR THE SECURING OF AN ELECTRO-ACOUSTIC DEVICE ON OR IN THE HUMAN EAR AND ELECTRO-ACOUSTIC DEVICE FOR USE IN THE METHOD

(57) Abstract

A method for the securing of an electro-acoustic device on or in the human ear (8) is applied by securing the device, for example a hearing aid (1), to the skin on or in the ear, for example on the tragus (3), by means of an adhesive (2).



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METHOD FOR THE SECURING OF AN ELECTRO-ACOUSTIC DEVICE ON OR IN THE HUMAN EAR AND ELECTRO-ACOUSTIC DEVICE FOR USE IN THE METHOD

Background of the invention

The invention relates to a method as presented in the preamble of claim 1.

Electro-acoustic devices to be placed at or in the ear have been known for several decades. Such devices are usually secured by means of a securing member, for example a carrying device in a headset, or by the electro-acoustic device being designed so that it is individually adapted to the ear to be mounted either externally on the ear or internally in the auditory canal or in the outer ear, like for example an electronic hearing aid.

Today three main types of electro-acoustic devices in the form of hearing aids are produced: portable, behind-the-ear and in-the-ear hearing aids, the two last-mentioned being the most commonly used today. The two last-mentioned types are acoustically coupled to the ear via an ear-plug, in that the in-the-ear hearing aid itself constitutes an ear-plug. This coupling method is applied to reduce the acoustic feed back from the sound reproducer to the sound receiver. Because of this coupling method the tympanic membrane of the ear will not be able to receive sound waves not passing the hearing aid; the coupling is thus called "closed hearing". Such a hearing aid requires both mechanical and acoustic adaptation to the ear on or in which it is to be mounted. This adaptation is time consuming and involves periods of waiting for the user, so that often several weeks pass from the first hearing test until the hearing aid is delivered. The known hearing aids moreover require a certain period of "getting-used-to", both in re-

spect of carrying a device being individually adapted to the ear and in respect of hearing in a new way. In-the-ear hearing aids are moreover secured by individual adaptation only, without particular securing members. The use of devices with ear-plugs or in-the-ear devices may also result in various side effects, such as increased cerumen production, due to the fact that the auditory canal is closed off for long periods of time.

Advantages of the invention

By proceeding as presented and characterized in claim 1, the possibility is provided of securing the device in a completely new manner offering a number of advantages. The individual adaptation of the device - as it is known from in-the-ear hearing aids - in order to secure it in the auditory canal is avoided, and all the drawbacks caused by the adaptation process are avoided too. Thus, a hearing aid secured according to the invention does not need to be individually adapted to the ear. Consequently, the time passing from the hearing test until the hearing aid is delivered can be drastically reduced. The consumption of time can actually be reduced to the time it takes to adjust the hearing aid to have it compensate for the hearing disability. The coupling system may be a glue or an adhesive of a type being compatible with human skin; an electrostatic or an electrodynamic device; a system based on a surface tension or a change of the surface tension, or another means or system being applicable for securing items to the skin. The coupling system may also be a combination of two or more securing methods.

By proceeding as presented and characterized in claim 2, the mounting of for example a hearing aid is simplified. Naturally there will be cases where it may be advantageous to apply the adhesive on the skin first, for example if a

hearing aid is not mounted by the user but by an assistant. However, in the vast majority of cases it will be advantageous to proceed as described in the claim.

As adhesive may be used different known types of adhesive being acceptable to the skin. The adhesive may be fluent or pastelike; it may be double-faced tape; plaster cut out or punched out in advance, or plaster being cut out into suitable pieces, and similar adhesives. This is the reason why in some cases it may be advantageous to proceed as presented and characterized in claim 3. The aid may be a means for applying the adhesive, or it may directly carry the adhesive.

By proceeding as presented and characterized in claim 4, the possibility is provided of achieving "open hearing", i.e. the user can hear sounds both from the surroundings and from the device. If the device is a hearing aid, a much more natural hearing perception is achieved in this manner compared to the known devices.

However, the invention will also be able to be applied in connection with in-the-ear hearing aids having a standard or a universal shell fitting tightly, or almost tightly, to the auditory canal, if the outside of the shell is elastic or deformable. Such hearing aids, which do not require individual adaptation to the form or the size of the auditory canal, may be of interest to persons suffering from an extensive hearing disability rendering heavy amplification necessary. Thus, the user must tolerate possible drawbacks caused by the acoustic coupling: so-called "closed hearing" or almost "closed hearing". Still, all the remaining advantages of the invention are achieved, i.e. the securing and the fact that the individual mechanical adaptation is rendered unnecessary.

In many cases, especially with hearing aids, it will be advantageous to proceed as presented and characterized in claim 5. In this manner a very discreet hearing aid is achieved, which can be designed or ornamented as a piece of jewellery or the like, if so desired, in order hereby to disguise the presence of a hearing aid.

By proceeding as presented and characterized in claim 6, the adhesion is improved and becomes more uniform. The possibility exists of combining the adhesive with the aid according to claim 3, or of using it in connection with the aid.

The invention also relates to an electro-acoustic device arranged to be secured using the above methods. This device may be designed as presented and characterized in claim 7. The device may be prepared to receive the adhesive in many different ways. An area on the surface can for example be particularly designed or marked to show where the adhesive should be applied. The said preparation may also consist in using a particular aid for applying the adhesive to the device or the skin.

The device is preferably a hearing aid as presented and characterized in claim 8. The hearing aid may for example be a remote-controlled hearing aid without outer operating means. The device is operated and adjusted from a master unit, for example a portable remote control unit designed like the known portable master units, i.e. as a pencil or in another way.

By designing the device according to the invention as presented and characterized in claim 9, all the advantages of the open-hearing principle can be achieved. If the device is a hearing aid, it thus need not in any way mechanically be individually adapted to the ear, which is very advant-

ageous in respect of production and storage. It is also an advantage to the user, who need not wait several weeks to have the device mechanically adapted.

The device according to the invention is preferably designed as presented and characterized in claim 10. It is hereby achieved that the device is secured without side effects, and in such a manner that the device can be removed and mounted as desired. The means may be mechanical or chemical or a combination of such means.

The drawing

The invention will hereafter be explained with reference to the drawing showing a preferred embodiment of the invention.

Description of the preferred embodiment

The drawing shows a hearing aid 1 designed according to the invention and secured by means of an adhesive 2 to the tragus 3 of the ear 8.

The hearing aid is oblong and slightly curved so that it fills about half of the auditory canal 5. It is naturally placed in such a manner that the sound reproducer 6 is directed towards the tympanic membrane, and the sound receiver 4 is directed towards the surroundings. The hearing aid is moreover designed with rounded edges and has such a form and size that it can be placed in the human ear without any further mechanical adaptation to the auditory canal being required.

The fact that the hearing aid 1 fills about half of the auditory canal 5 is only an example, as the form and size of the auditory canal as it will be recalled is highly in-

dividual. The shown oblong hearing aid is slightly curved, for example bean-shaped, allowing it to fit into most persons' auditory canal.

The hearing aid consists of an outer thin shell of plastic, for example acrylic plastic, surrounding the necessary electronic components, i.e. an amplifying circuit with a battery, a sound receiver and a sound reproducer, and possibly further circuits, for example a telecoil or the like, and means for receiving signals from a master (remote control unit).

The hearing aid 1 is secured by applying an adhesive to the plastic shell in a selected place. The adhesive may be applied directly or using the aid. The aid may be arranged to carry the adhesive and any means for cleaning the skin area to which the device is to adhere, for example the tragus. The cleaning means may be based on absorbtion or adsorbtion of skin secretion, for example cerumen.

The hearing aid shown in the drawing is only an example of how such a device can be designed and secured according to the invention. It will be obvious to a person skilled in the art that many other embodiments may be conceived also providing the possibility of securing the hearing aid to the ear by means of a coupling system according to the invention, for example by adhesion as shown.

The fact that in the drawing and in the description it is stated that the hearing aid, or any other electro-acoustic device, is secured to the tragus of the ear should only be regarded as an example of a place where the device according to the invention can be secured. The areas meatus acusticus externus and cavum conchae, or the area between these two areas, represent other applicable places for the securing of the device. It will be obvious to a person skilled

in the art that corresponding advantages will be achieved if the device is secured in other places in the ear or on the outer ear 8. Thus a device, for example a behind-the-ear hearing aid, might as well be secured behind the outer ear 8, so as to avoid the hook-shaped suspension method extensively used with behind-the-ear hearing aids today.

Also should it only be regarded as an example of the use of the invention that the above example is a hearing aid. It will be obvious to a person skilled in the art that other types of electro-acoustic devices also will be able to be secured using the method according to the invention, for example transducers for portable radios, tape recorders, CD players, etc. or different types of headsets.

C L A I M S

1. Method for the securing of an electro-acoustic device on or in the human ear, c h a r a c t e r i z e d in that the device is secured to the skin on or in the ear by means of a coupling system being compatible with human skin, e.g. an adhesive.

2. Method according to claim 1, c h a r a c t e r i z e d in that the securing is effected by applying a coupling system to the device to create a securing area, after which the device is positioned in such a manner that the securing area is placed or pressed against the skin in the place where the device is to be secured.

3. Method according to claim 1 or 2, c h a r a c t e r - i z e d in that an aid is used for applying the coupling system to the device or to the skin.

4. Method according to any one of claims 1-3, c h a r - a c t e r i z e d in that the device is secured in the auditory canal in such a manner that the auditory canal will not be closed acoustically from the surroundings.

5. Method according to any one of claims 2-4, c h a r - a c t e r i z e d in that the device is a hearing aid to be secured to the meatus acusticus externus, to the cavum conchae, to the area between these two areas, or on the tragus.

6. Method according to any one of claims 1-5, c h a r - a c t e r i z e d in that the coupling system comprises absorbing or adsorbing removable capacity towards skin secretion.

7. Electro-acoustic device (1) arranged to be secured on

or in the human ear (8) using the method according to any one of claims 1-6, c h a r a c t e r i z e d in that the device is prepared to receive a coupling system being compatible with human skin, e.g. an adhesive (2), so that a securing area appears on the outer surface of the device.

8. Electro-acoustic device according to claim 7, c h a r a c t e r i z e d in that it is designed as an item (1) having a substantially smooth surface surrounding an area for at least one sound receiver (4), at least one sound reproducer (6), an electronic amplifying circuit with at least one battery, and possible further components, which parts together constitute an electronic hearing aid.

9. Electro-acoustic device according to claim 8, c h a r a c t e r i z e d in that the item is oblong with the sound reproducer placed in the one end of the item, and that the cross-sectional profile of the item is designed so that it can be placed in an ear without closing the auditory canal (7) acoustically from the surroundings.

10. Electro-acoustic device according to any one of claims 7-9, c h a r a c t e r i z e d in that the coupling system is of a type acceptable to skin, and that the efficiency of the adhesion allows the device to be removed without damaging the skin, and that the coupling system comprises absorbing or adsorbing means for removing skin secretion.

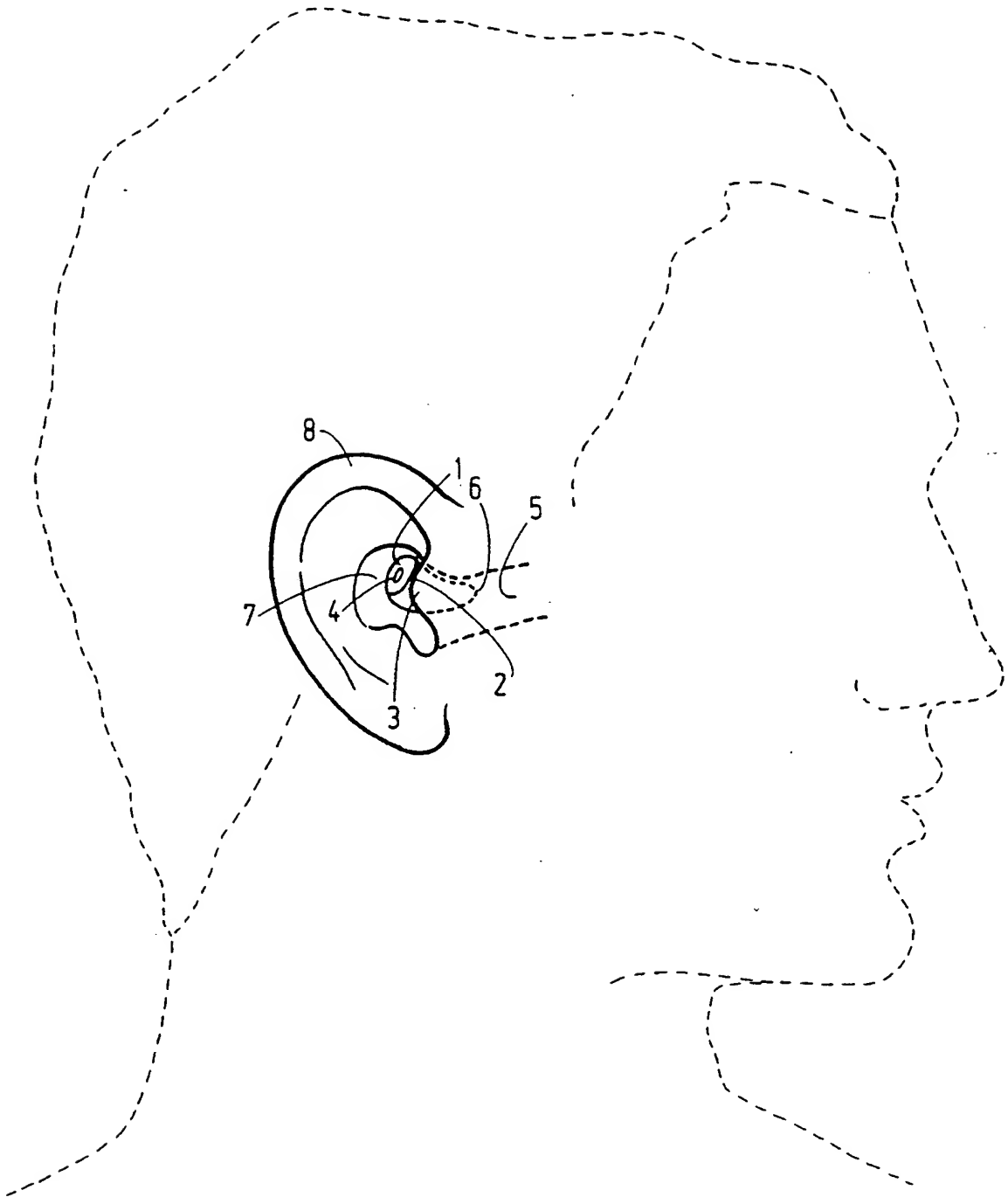

Fig. 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 92/00322

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: H04R 25/02
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

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IPC5: H04R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DIALOG; CLAIMS, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO, A1, 9209181 (RESOUND CORPORATION), 29 May 1992 (29.05.92), page 1, line 10 - page 2, line 26; page 4, line 4 - line 20; page 7, line 8 - line 14, page 13, line 28- page 14, line 6, page 15, line 21 - page 16, line 2; figures 1-4	1-5,7-9
X	US, A, 2678973 (W.E. NEWMAN), 18 May 1954 (18.05.54), column 2, line 47 - column 3, line 54, figures 1-7	1-2,7-8
A	US, A, 4130741 (GOTTLIEB), 19 December 1978 (19.12.78), figure 1, claims 1-3, abstract	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

02/07/93

International application No.
PCT/DK 92/00322

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 9209181	29/05/92	AU-A- 9035291	11/06/92
US-A- 2678973	18/05/54	NONE	
US-A- 4130741	19/12/78	NONE	